

2.4.12 Orbiter CCTV Interface

A special interface can be provided to allow the display of a customer payload generated TV signal in the crew cabin. This signal can also be recorded on-board or transmitted to the ground. The signals are standard National Television Standard Committee (NTSC) (EIA RS-170/RS-330) color or black and white television signals transmitted on a differential interface. Details of the CCTV interfaces and services can be provided by the project office.

2.4.13 Hitchhiker Video Interface Unit

The Hitchhiker Video Interface Unit (HVIU) is Hitchhiker-provided. Video can be accommodated from eight separate customer signal ports, one at a time. Switching of HVIU channels is commanded via ACCESS. The HVIU produces a differential signal output to the orbiter CCTV interface.

Customer video input to the HVIU shall be an unbalanced, 75-ohm interface and shall conform to RS-170 and RS-330 specifications. Shield shall be tied to frame ground at the customer side; the video signal lines shall be isolated from frame ground by at least 1 Mohm. Therefore, use of commercially available devices which tie signal ground to chassis should be avoided.

During the mission, availability of real-time video telemetry depends on orbiter support of payload CCTV and cannot be guaranteed. However, payload video can be recorded via the orbiter recorders and replayed at a later time during the mission or provided post-mission. Therefore, customers whose video is critical to their experiment are advised to consider incorporating recording capability in their hardware design.

2.5 *Hitchhiker-JR (HH-J)*

2.5.1 Hitchhiker-JR Overview

The HH-J carrier provides mechanical and electrical interfaces similar to the existing GAS carrier which has been used in the past to carry Shuttle secondary payloads. Following availability of the new carrier, the GAS carrier will not be used for secondary payloads.

The new avionics system (Figures 2.72 - 2.74) provides for better monitoring of carrier functions and can provide improved monitoring and power services for customer equipment if desired.

The HH-J carrier system consists of a canister (with or without a motorized door) equipped with a HH Remote Interface Unit (HRIU). The HRIU communicates via a control line with a Payload and General Support Computer (PGSC) in the crew cabin. The PGSC is a lap top class personal computer and contains payload unique software provided by SSPP.

The HH-J avionics is operated from Orbiter power unlike the GAS avionics which is battery operated. Orbiter power may also be used for heaters and can be used to operate customer equipment if certain restrictions are met. Customer equipment may also be operated from customer supplied batteries if desired.

During flight operations, the crew controls HH-J and GAS payloads using a menu type control and display interface on the PGSC. Unlike the avionics used with GAS, the HRIU reports carrier status information for display to the crew. The status information includes canister temperature

and pressure, customer battery voltage and current, door status, and commanded relay status. This information will help SSPP, the customer, and flight crew make decisions during the flight. On some missions it will be possible to record the status data in the laptop periodically for post flight use. Each HRIU has a unique data bus address allowing the crew to individually communicate with a number of HH-J canisters.

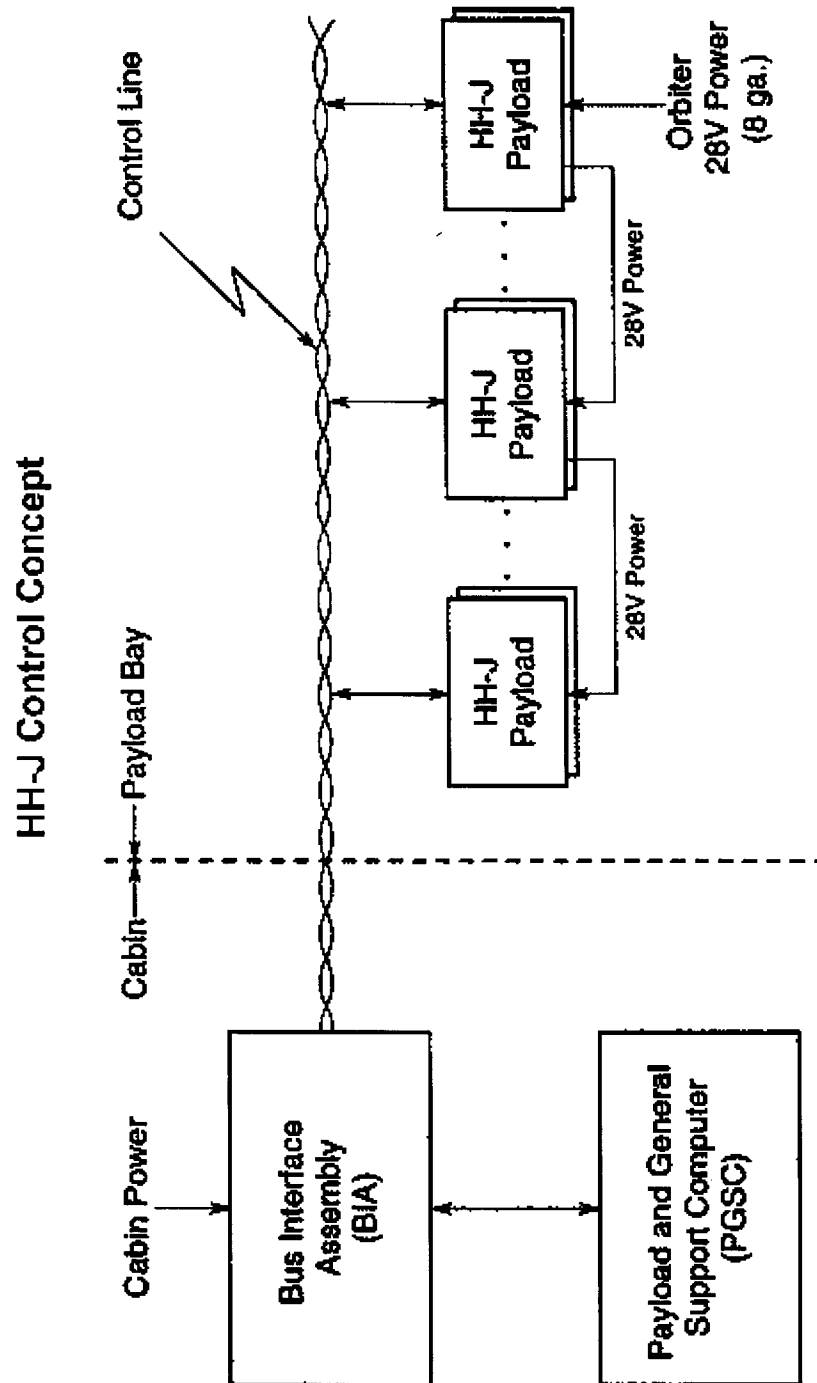


FIGURE 2.69 HH-J CONTROL CONCEPT

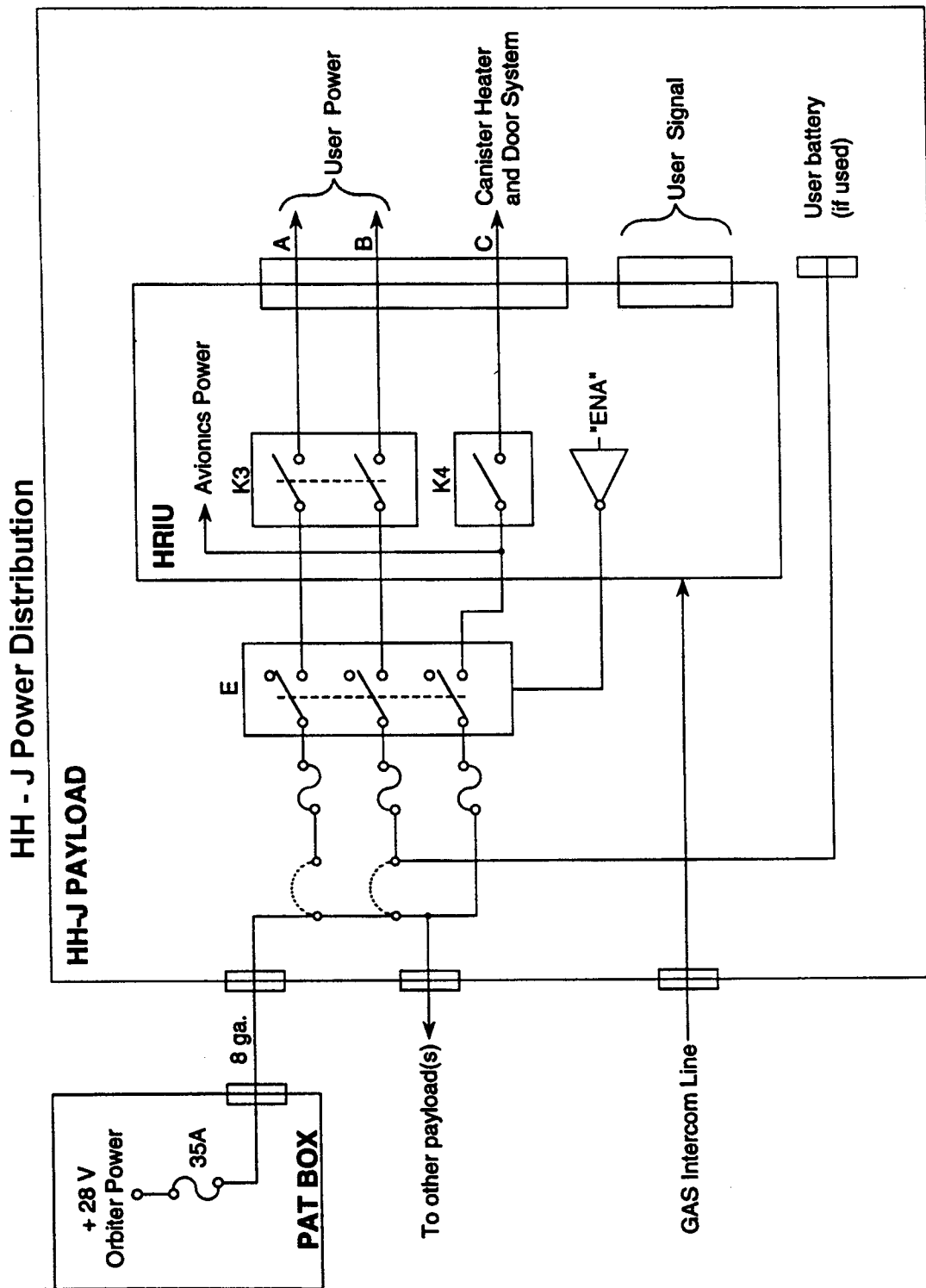


FIGURE 2.70 HH-J POWER DISTRIBUTION

If the customer desires and provides the necessary wiring, it is possible to provide the crew with some displays of customer hardware status.

Customer mechanical interfaces are the same as for the standard HH canister (section 2.1.1.). HH-J canisters may be flown on the side-mount or bridge configuration.

2.5.2 Hitchhiker-J Electrical Interfaces

2.5.2.1 HH-J Electrical Power

HH-J customer equipment may be operated from Orbiter power or from internal customer batteries with power switched by carrier relays in a manner similar to GAS as shown in Figure 2.70. If internal power is used, the carrier provides two size 12 power wires individually protected by 20 amp fuses in the carrier and switched by a crew controlled relay. Customer peak power should be limited to a maximum of 10 amps in either line because of vacuum derating of the fuses.

The enable relays ("E") in all the canisters are simultaneously activated by the crew near the beginning of the mission and deactivated near the end of the mission. The "E" relays are controlled by a single switch on the Bus Interface Assembly (BIA) in the cabin and are independent of the computer for safety reasons. The "E" relays provide power to the HRIUs in the canisters. Once the HRIUs are activated, the crew can individually activate the "K3" relay (to provide power to the customer equipment) and the "K4" relay (controlling canister heater and door power) in any specific canister.

The HRIU is provided with a current monitor which measures the total current in the A, B, and C power lines. The HRIU also measures the voltage on the down stream side of the K3 and K4 relays.

The customer may elect to use Orbiter +28 VDC power. In this case, maximum power draw of the equipment is limited to 100 watts and the energy use over the duration of the mission is limited to a maximum of 4 Kwh. The customer equipment must meet the requirements of section 2.3.1 with regard to power voltage, conducted electromagnetic noise emitted by the customer equipment, ground isolation, and susceptibility of customer equipment to Orbiter generated electromagnetic noise. Orbiter power is normally available starting several hours after payload bay doors are opened and extended to several hours prior to payload bay door closing.

2.5.2.2 HH-J Control Relays

The HRIU has two control relays "K1" and "K2" which may be used to control customer equipment. The relays are limited to 1 Amp and 32 volts and are break-before-make single pole double throw type. The nominal launch configuration of all relays is "reset".

2.5.2.3 HH-J Thermistors

The user may elect to place SSPP supplied temperature sensors in his equipment wired to the customer interface connector. The characteristics of the sensors are given in section 2.2.2. The use of the sensors will improve crew monitoring of significant temperatures in customer equipment.

2.5.2.4 HH-J Analog Telemetry Data

The user may elect to connect internal status measurements to carrier analog telemetry inputs which allow crew monitoring of a voltage between zero and +5 volts. A single measurement may be connected to the PCMAD signal line as defined in section 2.4.7.1. Also, an index pulse, PCMINDX, may be used to step a customer's internal multiplexer as described in section 2.4.7.1. For HH-J, only infrequent sampling of the data is possible. Contact the Project Office for more information.

2.5.2.5 HH-J Bi-level or Pulse Commands

Bi-level commands may be set to OV (false), or to +28V (true), or pulsed from false to true and back to false. (It is preferred to have the bi-level transverse from false to true, default state is OV for HRIU) All commanding of bi-level functions is performed by the mission specific Flight Software (FSW), which is developed at GSFC, and executed on the Payload & General Support Computer (PGSC). Four bi-levels are available to each customer. Only one bi-level signal may be commanded by the FSW at a time. A minimum of 100msec is required between each bi-level command. Figure 2.71 illustrates the HH-J bi-level command electrical interface.

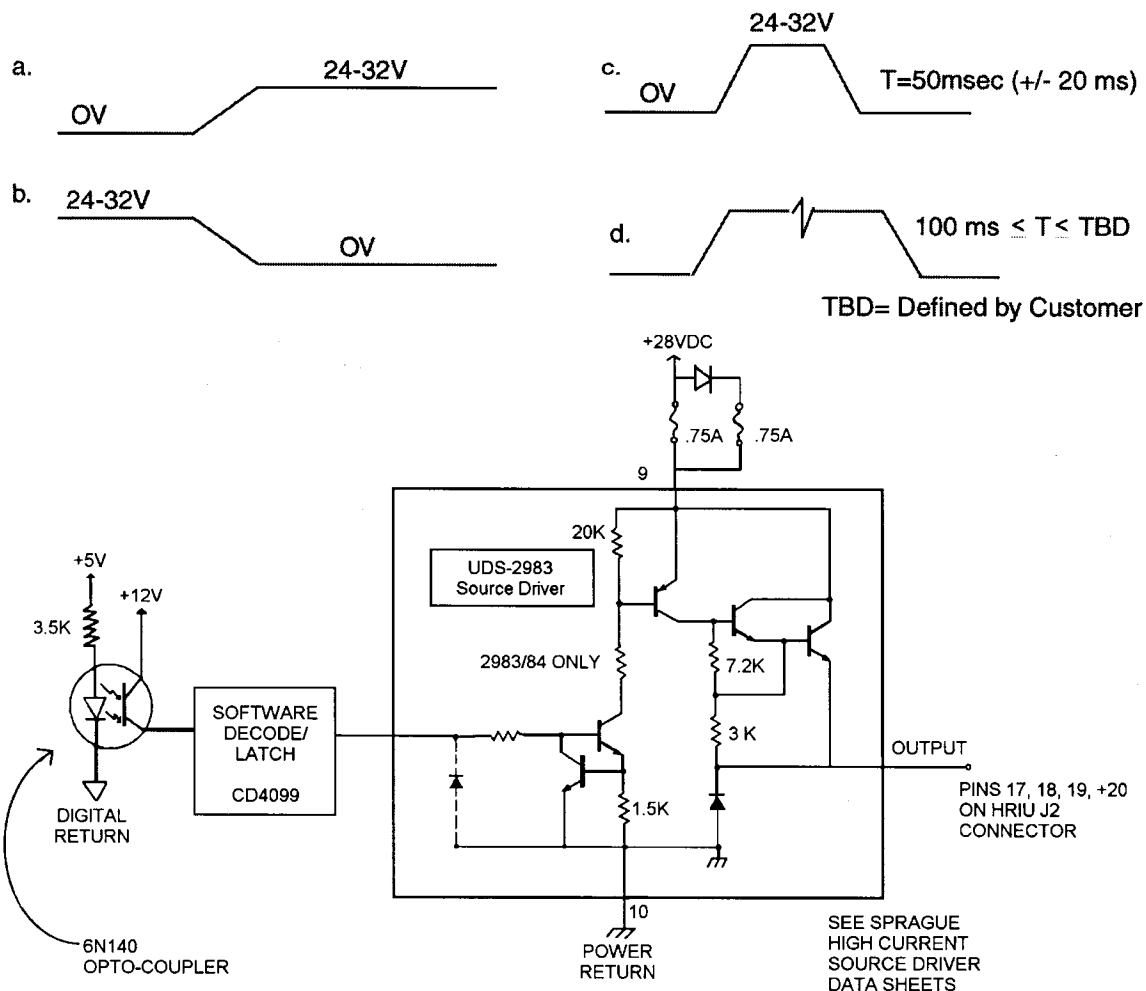


FIGURE 2.71 HH-J BI-LEVEL COMMAND ELECTRICAL INTERFACE

2.5.2.6 HH-J Customer Connectors

The HH-J canister bottom plate contains connectors for connecting customer equipment designated J13, J2, and J11 as shown in Table 2.21. J13 provides the Orbiter power interfaces, J2 provides signal interfaces, J11 connects to a connector on the canister bottom plate and can be used for ground test connection to customer equipment after it has been installed in a canister or for connecting two adjacent canisters during flight using an optional interconnect cable. An additional connector, J12 is used in place of J13 if the customer equipment contains its own battery. The Project Office will furnish connectors to the customer for use in fabricating the customer to carrier cables.

2.5.2.7 HH-J Grounding

The customer equipment return for Orbiter 28VDC power is Orbiter power return. If the customer provides his own battery power, the battery voltage may not exceed 32 VDC and the battery negative terminal should be connected to frame (structure) ground in the customer equipment. Orbiter power return connection in customer equipment using Orbiter power must be isolated from frame ground by a minimum of 10 K Ohms resistance. Orbiter power return is connected to frame ground in the Orbiter.

The reference for analog signals, thermistor returns, and PCMINDEX signal is carrier signal ground. The signal ground must be isolated from frame ground and Orbiter 28 V return by a minimum of 10 K ohms unless a project waiver is obtained. Signal ground is connected to frame ground in the carrier.

2.5.2.8 HH-J Electromagnetic Interference Control

HH-J customer equipment must meet the requirements of Appendix H.

2.5.2.9 HH-J Thermal Control

Customer equipment may contain heater(s) and thermostat(s) connected to the 28V Orbiter heater power lines (+28HTR, RETH) controlled by commandable relay K4 and not exceeding a maximum of 50 watts (for all heaters on simultaneously at 32 volts). Thermostats should not be set to a temperature higher than 5 degrees C unless approved by the Project Office.

2.5.2.10 HH-J Malfunction Inputs

Two of the thermistor inputs, THER1 and THER2, may instead be used as malfunction inputs. Malfunction inputs on HH-J are similar but not identical to the functions in the GAS carrier. A user may provide a "true" malfunction input to cause the carrier to reset the power relay in the carrier and remove power from the instrument. A malfunction true condition is indicated by an input voltage between zero and 2.0 volts relative to circuit ground, or by a resistance of less than 100 ohms between the malfunction input and circuit ground. A malfunction false condition is indicated by an input voltage between 3.5 volts and 5.0 volts or an input resistance higher than 100K ohms.

If a malfunction true condition is sensed at either of the malfunction inputs for 2 seconds or more, the HH-J carrier software will reset the power relay. The relay will remain reset unless set by the flight crew. The values of the malfunction input voltages are available for display to the crew in the Orbiter cabin.

The equivalent circuit for the malfunction input in the carrier is the same as for the thermistor input shown in Figure 2.69.

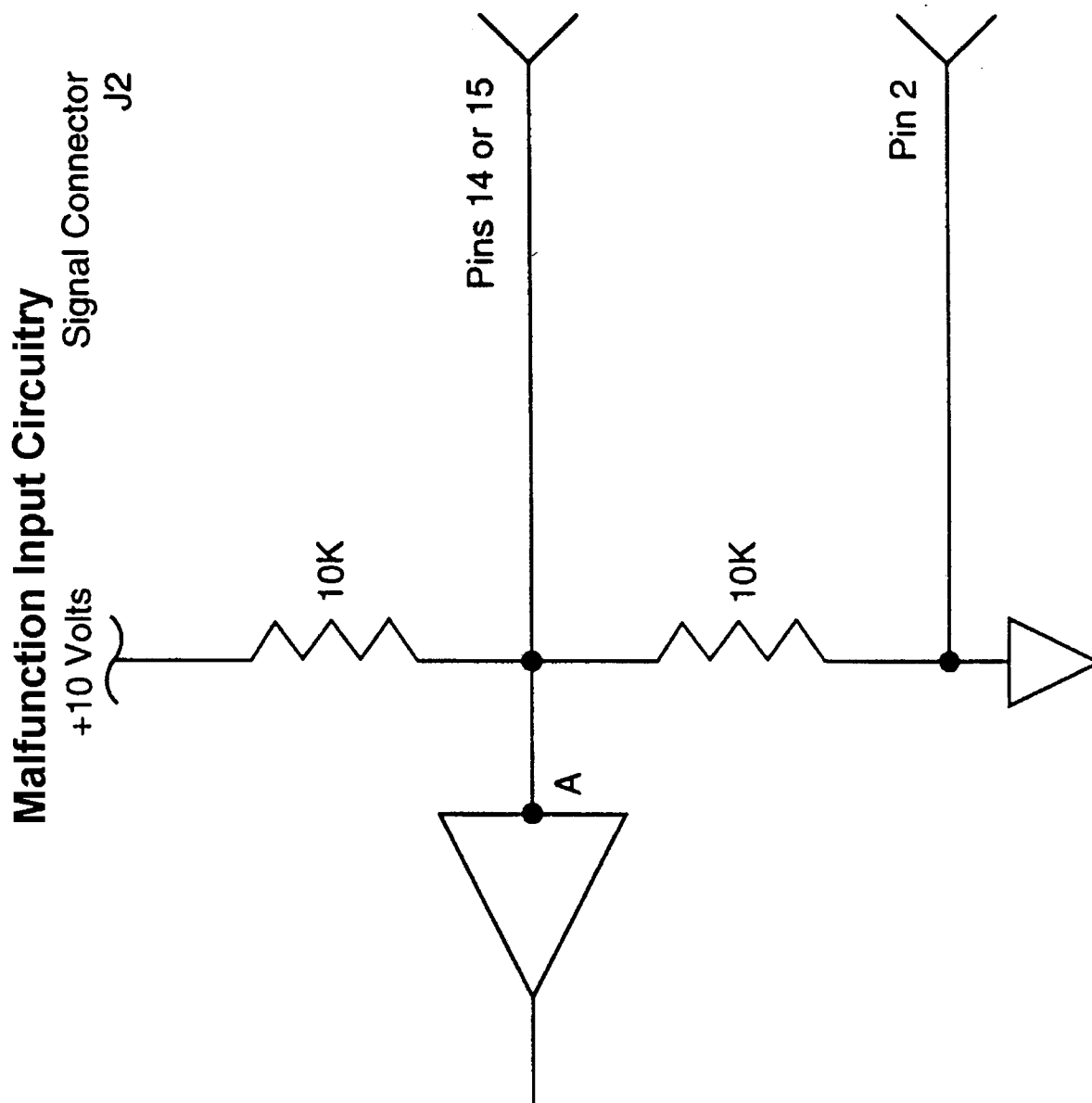


FIGURE 2.72 MALFUNCTION INPUT CIRCUITRY

TABLE 2.20 HITCHHIKER-JR ELECTRICAL INTERFACE CONNECTIONS

Power Connector P13 (Orbiter Power)

Customer Connector Type: CVA6R20-15PN-16

<u>ID</u>	<u>PIN</u>	<u>TYPE</u>	<u>FUNCTION</u>
+28	A	C	+28 Power Circuit A
RETA	B	C	Power Return (Note 1)
+28B	C	C	+28 Power Circuit B
RETB	D	C	Power Return (Note 1)
+28HTR	E	B	+28 Heater Power
RETH	F	B	Heater Power Return (Note 1)
FRMGND	G	B	Frame Ground

Signal Connector P2

Customer Connector Type: KJG6E18-35PN-16

PCMAD	1	A	Analog Data, 0 - +5v
PCMINDX	41	A	Index Pulse
SIGGND	2	A	Signal Ground
SHIELD	6	A	Shield (To Be Tied To Frame Ground In PLD)
BLCMD1	17	A	Bi-level/Pulse Command 1
BLCMD2	18	A	Bi-level/Pulse Command 2
BLCMD3	19	A	Bi-level/Pulse Command 3
BLCMD4	20	A	Bi-level/Pulse Command 4
THER1	14	A	Thermistor 1 Or Malf Input #1
THER2	15	A	Thermistor 2 Or Malf Input #2
THER3	16	A	Thermistor 3
K2RES	58	A	K2 Relay Reset Contact
K2SET	57	A	K2 Relay Set Contact
K2ARM	59	A	K2 Relay Arm
K1RES	49	A	K1 Relay Reset Contact
K1SET	56	A	K1 Relay Set Contact
K1ARM	50	A	K1 Relay Arm

Safe/Arm Or Interconnect Connector P11

Customer Connector Type: TVSO6RF-21-16S(453)

<u>ID</u>	<u>PIN</u>	<u>TYPE</u>	<u>FUNCTION</u>
	A	B	
	B	B	
	G	B	
	R	B	
	N	B	
	C	B	
	J	F	
	H	F	
	P	F	
	D	F	
	L	F	
	K	A	Twisted Shielded Pair TSP1+
	F	A	TSP1-
	E	A	TSP Shield
	M	A	TSP2+
	S	A	TSP2-

Power Connector P12 (Battery Power)

Customer Connector Type: JTO6RE-16-6S

BATA+	A	C	CUSTOMER BATTERY + CIRCUIT A
BATB+	B	C	CUSTOMER BATTERY + CIRCUIT B
PPWRA	C	C	CUSTOMER LOAD CIRCUIT A
PPWRB	D	C	CUSTOMER LOAD CIRCUIT B
+28HTR	E	B	ORBITER 28V HEATER POWER
RETH	F	B	HEATER POWER RETURN

Note 1: Power Return Pins B, D May Be Connected Together Within Payload.

Note 2: Wire Type Designation:

TYPE	SIZE
A	22 GA
B	16 GA
C	12 GA
F	20 GA

See Fusing Requirements In Table 2.6.

Note 3: Customer Will Make No Connections To Unused Pins